

## EXPANDED SITE INSPECTION

For:

Sandoval Zinc Company  
Box 263 Smelter Road Highway 51, Sandoval, Illinois  
ILD 053 980 454

Prepared by:  
Illinois Environmental Protection Agency  
Bureau of Land  
Office of Site Evaluation

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## **SECTION 1.0 INTRODUCTION**

On May 8, 2009, the Illinois Environmental Protection Agency's (Illinois EPA) Office of Site Evaluation was tasked by the United States Environmental Protection Agency (U.S.EPA) to conduct a Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Expanded Site Inspection at the Sandoval Zinc Company site located in Sandoval, Illinois. The site is in the southern ½ of the southeast ¼ of the northeast ¼ of Section 17, Township 2 North, Range 1 East of the Third Principal Meridian, in Marion County. See Figure 1 and Figure 2 for the location of the site. The site is located at latitude 38.61307 and longitude -89.11065. The site is designated by the Comprehensive Environmental Response Compensation and Liability Information System (CERCLIS) database as ILD 053 980 454.

The primary objective of an Expanded Site Inspection is to address critical hypotheses or assumptions that were not completely supported during the Site Inspection. The Expanded Site Inspection will gather information to fully establish background conditions, fill in data gaps, or establish attribution to site operations. At the conclusion of the Expanded Site Inspection, it will be determined whether the site qualifies for possible inclusion on the National Priorities List (NPL) or should be dropped from further Superfund consideration. Additionally, the Expanded Site Inspection supports removal and enforcement actions and collects data to support further Superfund or other response actions.

The Expanded Site Inspection is not intended to be a detailed extent of contamination or risk assessment. Efforts requiring intensive background investigation or specialized techniques are normally conducted during the next phase in the Superfund process after a site is placed on the NPL and becomes eligible for remedial funding. The Expanded Site Inspection is performed under the authority of the Comprehensive Environmental Response, Compensation and Liability

Act (CERCLA) commonly known as Superfund.

The Sandoval Zinc Company site was placed on CERCLIS on December 1, 1983 in response to concerns that past site activities may have resulted in soil and sediment contamination on the site and throughout the surrounding area. The Illinois EPA conducted a Preliminary Assessment in 1986, a Screening Site Inspection in 1988, and an Expanded Site Inspection in 1997. Currently the site is still abandoned and is being managed by the Illinois EPA Federal Sites Remediation Section.

In August of 2009, the Illinois EPA's Office of Site Evaluation (OSE) prepared and submitted a work plan for the Sandoval Zinc Company site to the Region V offices of the U.S.EPA. The sampling portion of the Expanded Site Inspection was conducted during the week of October 19-22, 2009. During the ESI, the Illinois EPA sampling team collected fifteen sediment, twenty-seven soil, and four slag/waste samples from the Sandoval Zinc facility and surrounding area. The 2009 ESI was conducted to help determine the levels of contamination present at the Sandoval Zinc facility as well as any receptors which could potentially be impacted by former activities at the site. These potential receptors include designated wetlands, environmental and aquatic wildlife and human receptors.

## **SECTION 2.0 SITE BACKGROUND**

### **Section 2.1 Site Description**

The Sandoval Zinc facility is located east of the City of Sandoval. The facility is located approximately 1440 feet (0.27 miles) east of U.S. Route 51 and 2240 feet (0.42 miles) south of U.S. Route 50 at the eastern end of Smelter Road (a.k.a. Mississippi Avenue). The site consists

of 14.16 acres of property located in the south half of the southeast quarter of the northeast quarter of Section 17, Township 2 North, Range 1 East, in Marion County, Illinois. The property is bounded to the east and south by open agriculture land, to the west by a vacant parcel of land containing various types of vegetation and trees and to the north by the CSX Railroad tracks. To the north of the railroad tracks is agricultural land, wetlands and property currently owned by the Village of Sandoval.

Surface water runoff routes are noticeable by the gullies and erosion patterns flowing from the site and near the boundaries of the property. Runoff from the site follows a radial type pattern due to the site being higher in elevation at its middle than at the perimeter.

There are two main drainage pathways from the site. The first is located to the west of the site property. This intermittent drainage way runs from north to south, located approximately 300 feet west of the western boundary of the site. Surface water from the western portion of the property flows to this intermittent drainage ditch. This drainage ditch then flows southwest for 0.7 miles to Prairie Creek. The surface water then continues along Prairie Creek for 13 miles until Prairie Creek intersects Lost Creek. The surface water then continues for two miles along Lost Creek. The 15 mile target distance limit ends in Lost Creek just north of Route 161.

Surface water flows from north to south from the northeast portion of the Sandoval Zinc property. Surface water from the property enters into the wetlands approximately 300 feet west of the northeast corner of the property then flows through the property (wetlands) and exits the southeast corner. The wetlands and surface water continues on a north to south route until the wetlands are 100 feet north of the south perimeter of the fenced property where it bends to the

east. Approximately 250 feet east of this bend in the wetlands, the wetlands bend to the southeast then exit the property 30 feet north of its southeast corner. Surface water runoff collects in low areas to the north and south of the site, but eventually flow to the wetlands to the east. The eastern drainage pathway is composed of designated wetlands. These wetlands drain into Prairie Creek. Prairie Creek is a perennial water way located approximately 2000 feet south of the southeastern corner of Sandoval Zinc flowing in a southwesterly direction. The wetlands empty into Prairie Creek at approximately 2000 feet from the southeastern corner. The surface water pathway continues for approximately 13 miles to Lost Creek. Once entering Lost Creek the surface water pathway continues for two miles to the terminus of the 15 mile target distance limit.

The Sandoval Zinc Company site can be accessed by vehicle via an asphalt and gravel road which runs east from U.S. Route 51 and through a locked but dilapidated gate at the southwest corner of the property. No buildings are present, only large concrete building foundations remain of the former facility. There is no activity and no caretaker or guards on the property. Although the property has been officially sealed by the Illinois EPA, including the construction of a perimeter fence, the property has on numerous occasions been accessed by local residents with visible signs of trespassing.

### 2.1.1 Site Geology

The property is located in an area of south central Illinois where surficial terrain has been shaped by various types of glacial deposition. The land surface has been modified by glacial activity into the relatively flat to gently rolling plains characteristic of glacial drift regions. The topography surrounding the site is relatively flat and lies at approximately 500 to 505 feet above mean sea level (MSL). An artificial mound of cinder/slag and other fill material has raised the elevation of the central portion of the site to approximately 510 feet MSL. The site surface slopes gently to the lower elevations on all sides, except to the east, where a rapid drop of about five feet occurs, down to the eastern drainage channel. East of this channel is an on-site pond. The pond was used by Sandoval Zinc as process water supply. Established vegetation ranging from grasses to mature trees is present around the pond with no visible evidence of stress to the vegetation.

### Section 2.2 Site History

The Sandoval Zinc Company smelter facility began operating as a primary zinc smelter in 1898. On September 24, 1914, a fire destroyed the smelter. In 1915, the company began operating as a secondary zinc smelter. Compounds fed into the kilns were pure zinc, zinc oxide, zinc chloride, possibly aluminum chloride and other trace metals. The facility remained a secondary smelter until the facility was closed in 1985. In December of 1986, the Sandoval Zinc Company was officially dissolved and the owners declared bankruptcy.

The Sandoval Zinc Company property is currently owned by a private individual recorded



on February 2, 2006. Prior to the current owner, the property was owned by the Marion County Trustee. Prior to the Marion County Trustee, the site was owned by White Brothers Salvage and Recycling who received the title from Albert F. Haas per warranty deed. Albert F. Haas received the title for the property from a corporation deed from Sandoval Zinc Company executed on March 14, 1988.

During the first eighty-five years of operation, the principle waste emissions from the plant were metal laden cinder/slag and windblown ash. Large quantities of cinder/slag from the smelting process were used in constructing and surfacing secondary roads in the plant and as fill material on the property. Due to filling on the site, layers of cinder/slag range from one to ten feet thick over the twelve acres. Cinder/slag material that were unable to be utilized by the plant were placed into large piles on the property and offered to the public and the Village of Sandoval for use in constructing and surfacing roadways, driveways, sidewalks, and parking lots (Illinois EPA, BOL File, Interviews conducted by Ken Corkill). Many areas throughout the Village of Sandoval exhibit evidence of the use of cinder/slag. Probing adjacent to driveways and sidewalks reveal cinder/slag, some of which have since been covered with concrete.

The windblown ash was emitted from the smelter stacks for many years. This ash settled on the plant site and the surrounding community and farmland. Typically, ash from secondary zinc smelters using retort furnaces is high in concentrations of heavy metals. The volume of ash emitted from retort stacks averaged between 50 to 100 tons per year (Ebasco, p. 1-3). Additional sources of wind-borne emissions may have resulted from handling practices of plant waste products. This might have included open storage of waste cinder/slag and ash and bulk storage

of products, mostly zinc oxide. The zinc oxide was stored inside plant buildings which would have reduced wind-borne emissions. In 1970, in compliance with air pollution regulations, a stack scrubber was installed. Sandoval Zinc ceased operations in 1985.

### Section 2.3 Previous Investigations

A CERCLA Preliminary Assessment was completed on December 19, 1986 with a higher priority rating. A CERCLA Site Inspection was completed on March 31, 1988. On April 24, 1991, a seal order was placed on the abandoned facility by the Illinois EPA. The Illinois EPA undertook removal actions in November 1991 in response to a spill of fuel oil from an above ground storage tank. In April 1993, Ebasco Environmental Inc. (Ebasco) completed a Draft Feasibility Study for the site (a Final Feasibility Study was never completed). Lead was found to be greater than 10,000 ppm. Elevated levels of copper, nickel, and zinc were also found at the site.

In September 1995, a second CERCLA Screening Site Inspection was completed with a high priority and a recommendation that the site continue in the CERCLA process. In May 1996 the Illinois EPA sent out enforcement 4(q) Notices to approximately 20 Potentially Responsible Parties (PRPs) for cleanup to be performed on the inside of the buildings. In April 1997, an additional fifty 4(q) Notices were sent to additional PRPs.

Additional cleanup activities performed in 1998 consisted of repairing and replacement of fencing, conducting a site inventory of the waste materials to be removed from the site including all readily quantifiable volumes of materials in drums or other containers and in spills on the ground. The following actions were also completed during the cleanup activities: the proper

abandonment and sealing of monitoring wells; the removal and containerization of hazardous substances inside the buildings including zinc oxide waste and fuel oil contaminated soils; the removal and containerization of miscellaneous non-hazardous wastes including plastic jugs and construction type debris; and the cleaning, demolition, and disposal of two above ground fuel oil storage tanks. Pressure washing, demolition and disposal of site buildings and materials were also completed. Currently, the site is owned by a private individual.

#### Section 2.4 Regulatory Status

Based upon the available file information, the Sandoval Zinc Company was at one time, subject to the Resource Conservation and Recovery Act (RCRA). On December 5, 2005, there was a RCRA Non Financial Records Review of the Sandoval Zinc site. On August 3, 1994, Sandoval Zinc notified the U.S.EPA as a Large Quantity Generator of hazardous waste. Due to Sandoval Zinc no longer being in operation, the Large Quantity Generator designation is no longer applicable. RCRA focuses only on active or future facilities and does not address abandoned or historical sites which are managed under CERCLA. Information currently available does not indicate that the site is under the authority of the Atomic Energy Act (AEA), Uranium Mine Tailings Action (UMTRCA), or the Federal Insecticide Fungicide or Rodenticide Act (FIFRA).

Sandoval Zinc Company has had numerous complaints registered against it, mainly due to its stack emissions. Attorneys representing an area farmer contacted Illinois EPA in 1987 alleging that the farmer had land and crops which were being impacted by contamination from

the site. A June 1987 analysis by the Illinois Department of Agriculture of soybean plants from the subject field indicated healthy looking plants contained zinc at 260 ppm while dying plants contained zinc at 933 ppm. Analysis of water and sediment samples collected by Illinois EPA personnel on March 30, 1987 from the west and east drainage ditches adjacent to the site revealed evidence that zinc and cadmium discharges had occurred over time. Levels found in the water samples exceeded surface water quality limits. Due to these exceedances, Sandoval Zinc Company was in violation of the ambient surface water quality limits set forth in Title 35, Subtitle C: Water Pollution, Section 304.124.

## **SECTION 3.0 EXPANDED SITE INSPECTION ACTIVITIES**

### **Section 3.1 Sampling Activities**

During the Expanded Site Inspection, all samples were collected in accordance with the Illinois EPA's Quality Assurance Project Plan (QAPP) and the Illinois EPA's Bureau of Land Sampling Procedures Guidance Manual. Soil and sediment samples were collected with stainless steel trowels or augers and put directly into sampling jars. All samples were analyzed by the federal contract laboratory program.

#### **Section 3.1.1 Sediment Sampling**

In October 2009, fifteen sediment samples were collected from the drainage area to the east of Sandoval Zinc in order to determine if contaminants may have migrated from Sandoval Zinc into the adjacent pond and wetlands. These samples were analyzed for the inorganic portion of the Target Compound List. All sediment samples were collected with a hand auger from the

top six inches of sediment. The locations of the sediment samples are depicted in Figure 5 and the analytical results can be seen in Table 4. Sediment samples were collected following the procedures described in the Bureau of Land Sampling Procedures Guidance Manual (p. 10.6 – 10.7).

### Section 3.1.2 Soil Sampling

Twenty-seven soil samples were collected from residential areas within Sandoval, located west of the Sandoval Zinc property. These samples were collected to help determine whether contamination from Sandoval Zinc has been utilized in the filling of low residential areas and as base for roads and sidewalks. These activities could pose a hazard to the residents.

The soil samples were collected with hand trowels and analyzed for the inorganic portion of the Target Compound List. All soil samples were collected within the top six inches of soil. The locations of the soil samples can be seen on Figure 3 and the complete analytical results can be seen in Table 2. Soil samples were collected following the procedures described in the Bureau of Land Sampling Procedures Guidance Manual (p. 6.7 – 6.8).

### Section 3.1.3 Groundwater Sampling

Groundwater samples were not collected due to the Village of Sandoval receiving its drinking water from Centralia. Due to the absence of human consumption of groundwater from the surrounding area, the groundwater pathway was not evaluated.

### Section 3.1.4 Waste Sampling

Four samples were collected from materials located on the Sandoval Zinc property.

These four samples were collected near the four corners of the site property (Figure 4). These samples were collected to help determine the levels of contamination that exist on the Sandoval Zinc property that could potentially migrate to environmental receptors. These samples were collected with hand trowels and were analyzed for the inorganic portion of the Target Compound List. The locations of the waste samples can be seen on Figure 4 and the analytical results can be reviewed in Table 3. Waste samples were collected following the procedures described in the Bureau of Land Sampling Procedures Guidance Manual (p. 5.7 – 5.8).

Two samples were collected for Toxicity Characteristic Leaching Procedure (TCLP), and the analytical results are presented in Table 5. These samples (T101 and T102) revealed barium, cadmium, selenium, and lead to be above the TCLP regulatory limits. Samples T101 and T102 were collected from the waste material located on the Sandoval Zinc Company site. TCLP samples were collected following the procedures described in the Bureau of Land Sampling Procedures Guidance Manual (p. 5.7 – 5.8).

## **SECTION 3.2 ANALYTICAL RESULTS**

### **Section 3.2.1 Sediment Sample Results**

Fifteen sediment samples were shipped to ChemTech Consulting Group located at 284 Sheffield Street in Mountainside, New Jersey for inorganic analysis. Sediment sample X214 and X215 were utilized as background samples due to the sample locations being up-gradient of the facility. All sediment samples were collected from 0 - 6 inches from similar media located in the drainage wetland area. Inorganic analysis revealed significantly elevated levels of antimony, cadmium, copper, lead, nickel and zinc. Refer to Table 1 for sediment sample descriptions and

to Table 4 for the inorganic results for sediment samples.

### Section 3.2.2 Soil Sample Results

Twenty-seven soil samples were shipped to ChemTech Consulting Group located at 284 Sheffield Street in Mountainside, New Jersey for inorganic analysis. All of the soil samples were collected from residential areas inside the municipal boundaries of Sandoval. These samples were collected to determine the impact of inorganic contaminants in the area. Soil sample media was similar in nature being brown silt to brown silty clay. All samples were collected within the 0 – 6 inches from the surface of the soil. Soil sample descriptions can be found in Table 1.

Soil samples X119 and X126 were collected from residential areas west of the facility and represent background conditions.

Upon comparison to background concentrations, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, selenium, silver, sodium and zinc exceeded three times the background levels for soil samples (Table 2).

### Section 3.2.3 Waste Sample Results

Four waste samples were shipped to ChemTech Consulting Group located at 284 Sheffield Street in Mountainside, New Jersey for inorganic analysis. Inorganic analysis revealed elevated levels of antimony, arsenic, barium, cadmium, chromium, copper, iron, lead, mercury, nickel, selenium, silver, sodium, and zinc. Antimony, cadmium, copper, lead, nickel, and zinc significantly exceeded background concentrations in all four waste samples. Waste sample

results can be viewed in Table 3.

TCLP results indicated that barium, cadmium, lead and selenium were found to be in excess of the maximum concentration of contaminants for the toxicity characteristic.

## **SECTION 4.0 SITE SOURCES**

### **Section 4.1 Introduction**

This section includes descriptions of the various hazardous waste sources that have been identified at the Sandoval Zinc Company site. The Hazard Ranking System defines a “source” as: “Any area where a hazardous substance has been stored, disposed or placed, plus those soils that have become contaminated from migration of hazardous substances.” This does not include surface water or sediments below surface water that have become contaminated.

Information obtained during the Expanded Site Inspection identified two separate source areas. These sources areas were identified as the waste pile located on the Sandoval Zinc property and the contaminated soil located along the overland flow route.

This section will briefly discuss the hazardous waste sources which have been identified through CERCLA site investigation process.

### **Section 4.2 Waste Pile**

The entire fenced portion of the site could be classified as a waste pile as byproducts of the smelting operations. Over the years, cinder/slag and ash were deposited directly on the site ground surface. Cinder/slag material is estimated to be up to ten feet deep in some areas of the site. The practice of disposing of waste in this manner began with the opening of the plant in the



late 1880s and ended in 1970 when a scrubber system was placed on the plant stack. Scrubber waste was subsequently placed into a dewatering lagoon (100 ft by 100 ft by 4 ft deep), constructed into the cinder/slag waste pile east of the plant buildings and allowed to dry. After dewatering, the sludge material was reprocessed or sold to fertilizer companies. The lagoon is no longer visible and the specific location is not known.

During the 1997 CERCLA ESI sampling event, five soil samples were collected from various locations on the Sandoval Zinc Company property. Analysis of the collected samples indicated numerous contaminants above background concentrations with many being three or more times background concentrations. The contaminants which exceeded three times background in all four samples included antimony, arsenic, cadmium, copper, lead, nickel and zinc. Chromium (X301, X303, X304), mercury (X301, X302, X304), and selenium (X301, X302, X304) exceeded three times background concentrations of three of the four waste samples. Iron exceeded three times background concentrations in samples X301 and X304. Silver exceeded three times background concentrations in samples X301 and X302. Sodium and barium exceeded three times background concentrations for X301.

Groundwater sample analysis from the Ebasco Services Incorporated, April 1993 investigation revealed high concentrations of cadmium, chromium, copper and silver in groundwater adjacent to the site. The Illinois State Water Survey/Illinois State Geological Survey (ISWS/ISGS) investigation, *Retention of Zinc, Cadmium, Copper, and Lead by Geologic Materials* (conducted from 1975 to 1982) revealed zinc contamination up to 28 feet below ground surface (ISWS, p.37).

Samples collected from May and June of 1990 and from April 1991 by Ebasco indicated aluminum, calcium, copper, iron, lead and zinc were found in high concentrations in most of the samples.

During the 1997 Expanded Site Inspection, five samples were collected from the Sandoval Zinc property. These samples along with the samples collected by Ebasco and the ISGS were utilized in determining the source area and to determine soil contaminant concentrations. Based on these samples, the source area is approximately 566,280 square feet (1997 ESI, p. 15).

Four samples were collected from the waste pile located onsite during the 2009 ESI. These samples revealed elevated levels of antimony, arsenic, barium, cadmium, chromium, copper, iron, lead, mercury, nickel, selenium, silver, sodium, and zinc. Antimony, cadmium, copper, lead, nickel, and zinc significantly exceeded background concentrations in all four waste samples. X119 and X126 were chosen as representative background concentrations of inorganics. X119 and X126 are located outside of the influence from windborne emissions from the former Sandoval Zinc Company. These background locations were also chosen due to the absence of cinder/slag waste material. Waste sample results can be viewed in Table 3. All of the samples utilized for source determination were taken in the upper two feet of soil, in runoff areas and areas which were used to dispose of ash and cinder/slag wastes attributable to former site activities. Based on the results from the waste samples, the waste pile source is an area of approximately (238,021 square feet). This is based on calculations from ArcMap. It should also be noted that the concrete building pads have been subtracted out of the final area of the waste

pile.

#### Section 4.3 Contaminated Soil (Overland Route)

During sampling activities conducted in 1996, one soil sample was collected from the west bank of the pond east of the Sandoval Zinc property. Sample analysis indicated several contaminants were above background concentrations and similar in nature to those detected in the contaminated soil on Sandoval Zinc property. The radial nature of site drainage has provided the mechanism by which contaminants have migrated from the property boundaries resulting in an additional area of contaminated soil. Even though the investigations of the Sandoval Zinc Company site have determined that there is contamination outside of the facility boundaries, the full extent of soil contamination has not been determined. Based on the analysis of soil samples collected at the Sandoval Zinc Company property and beyond, the current area of contaminated soil is estimated to be 425,000 cubic yards (Ebasco, p. 6-3). The purpose of the sampling beyond the property boundary was to determine if runoff from the property had affected the area surrounding the property.

#### Section 4.4 Contaminated Soil (Residential Yards)

Residential soil samples collected from within the Village limits of Sandoval indicated that contamination attributable to the processes at the former Sandoval Zinc Company is present. There were 16 residential yards which have been found to contain elevated levels of lead. U.S.EPA has not established a level one benchmark for lead in residential soils. It is assumed that residents in the area utilized the cinder/slag material from Sandoval Zinc as fill in residential

neighborhoods. Unused cinder/slag material was also used for road and sidewalk base. Due to the random distribution of the cinder/slag material in Sandoval, it is difficult to assess the amount of contamination present, and each residential yard should be considered a separate source.

## **SECTION 5.0 OTHER POSSIBLE SOURCES**

### **Section 5.1 Former Zinc Oxide Pile**

The subject waste piles were located inside the buildings on the property. These piles were composed of mainly zinc oxide. These piles have been sampled during previous investigations with analytical data recorded in April 14, 1989 and April 7, 1993 reports. The piles were found to contain elevated concentrations, above remediation objectives, of aluminum, iron, lead and zinc. Copper and nickel were also found to be above remediation objectives in one of the locations (71,000 and 14,000 ppm respectively). Lead ranged from 1,100 to 63,000 ppm and zinc ranged from 27,000 to 680,000 ppm. These piles have been removed from the property.

## **SECTION 6.0 MIGRATION PATHWAYS**

### **Section 6.1 Introduction**

CERCLA identifies three migration pathways and one exposure pathway by which hazardous substances may pose a threat to human health and/or the environment. Consequently, sites are evaluated on their known or potential impact to these four pathways. The pathways evaluated are groundwater migration, surface water migration, air migration and soil exposure. The following section discusses these pathways and the site's impact or potential impact on them and on the various human and environmental targets. These targets include human populations,

fisheries, wetlands and other sensitive environments.

## Section 6.2 Groundwater Pathway

According to the Illinois State Geological Survey and the Illinois State Water Survey the Sandoval Zinc Company site is located in the south central portion of the Illinois Basin. This is a large Paleozoic spoon shaped sedimentary basin. Surficial deposits overlaying the bedrock strata of the basin are unconsolidated glacial tills, outwash, and drift. The thickness and composition of these deposits vary across the state, typically thinning to the south.

The glacial deposits of south central Illinois are composed primarily of till, poorly sorted clay, silt, sand and pebbles laid down during the four major Pleistocene advances of the glaciers (Nebraskan, Kansan, Illinoisan and Wisconsinan advances).

The subsurface geology at the Sandoval Zinc Company site was investigated through soil borings during previous site investigations conducted by Ebasco and Illinois EPA. The generalized stratigraphy at the site, beneath the cinder/slag fill, consists of glacial deposits of varying thickness overlying the Pennsylvanian Bond Shale. Based on the previously mentioned soil borings, the glacial deposits consisting of Peoria Loess and Roxana Silt of the Wisconsinan Stage; the Berry Clay of the Sangamonian Stage; the Hagarstown Member and the Glasford Till of the Illinoisan Stage were found to depths of approximately 20 feet below ground surface. The Peoria Loess is brownish-gray clayey silt with small amounts of sand that was formed by wind deposits of fine particulate matter. The loess ranges in thickness from 6 to 12 feet throughout the Sandoval Zinc Company site. Below the Peoria Loess is the Roxana Silt, this is a dark brown clayey silt with approximately 30 percent sand content. The Roxana Silt is thin beneath the site

ranging in thickness from 1 to 2 feet. The Berry Clay, below the Roxana Silt, is dark gray in color and is a sandy, silty clay with some small gravel. The Hagarstown Member of the Illinoisan Stage, below the Berry Clay is a thin silty sand approximately 1 to 2 feet in thickness. At times this strata is difficult to distinguish from the underlying till. This unit is the only one which is water-bearing in the vicinity of the site. The Glasford Till, below the Hagarstown Member, consists of gray to dark gray sandy and silty till which is approximately 20 to 40 feet thick throughout the area beneath the site. Small lenses of sand, silt, and clay can also be found within the till.

Previous investigations by the ISWS/ISGS determined the glacial deposits below the Glasford Till to be the Lierle Clay and the Banner Formation Till. Underlying the Banner Till, at depths of 55 to 75 feet below ground surface is the Pennsylvanian Bond Formation which is a micaceous green shale. The Ebasco and Illinois EPA borings were finished at shallower depths than those of the ISWS/ISGS study, and were also located at the edge of the facility, where the artificial fill material was not encountered.

Much of the regional groundwater in Marion County, particularly in the western portion of the county, is retrieved from the unconsolidated glacial deposits that cover the Pennsylvanian bedrock. In some areas, Pennsylvanian sandstones are a source of groundwater, mostly in the southwestern portion of the county. Where sandstone units occur, groundwater can be drawn from the top 150 to 200 feet of the units (ISGS, 1957). A pre-glacial valley in the west-central part of Marion County has thick deposits of unconsolidated sands and gravels. These deposits are a source of limited private water supplies. Most of the local water supply for the farms and

residences surrounding the Village of Sandoval is obtained from large diameter wells completed in the unconsolidated deposits of the Hagarstown Member. These wells, which were either dug or bored, usually tap lenses or thin layers of water-bearing silty sand or gravel only a few inches thick (ISGS, 1980). The wells range in depth from 30 to 60 feet with water levels varying up to 10 feet due to seasonal precipitation and recharge rates. These wells may only produce a few hundred gallons of water per day. There is no potential for providing enough water for a municipal supply. According to the Illinois EPA's Bureau of Water surface water assessment program, there are no known drinking water wells within 4 miles of the Sandoval Zinc property. Test holes drilled into the Pennsylvanian Bond Shale have encountered only a few thin beds of water-bearing sandstone and creviced limestone. Below depths of 100 to 150 feet beneath ground surface, water is potentially too mineralized to be used for domestic purposes. Conversations with the Sandoval Municipal Water Supply have revealed that all individuals in the area are supplied with a public water supply.

The Village of Sandoval, with a population of approximately 1535 persons, is supplied with drinking water by the community of Centralia, which obtains source water from Carlyle Lake and Racoon Lake. Carlyle Lake is located northwest of the site and Racoon Lake is located south of the site. Neither of these lakes is connected by overland flow to Prairie Creek nor any runoff from the Sandoval Zinc Company site.

Groundwater beneath the site and around its perimeter has been contacted at between five and eight feet below ground surface. Depth of soil and groundwater contamination is based on previous site studies completed by ISWS/ISGS, Ebasco and Illinois EPA. Inorganic analyte

contamination to approximately 28 feet below ground surface was found through soil coring and groundwater well samples completed and collected by ISWS/ISGS. Similar contaminants were found in groundwater beneath the site by Ebasco and Illinois EPA. These groundwater monitoring wells did not extend below 20 feet below ground surface.

Based on the cinder/slag fill covering the site to depths of 10 feet and groundwater being present at between four and eight feet beneath ground surface, groundwater therefore is in contact with fill material and contaminated soil. Volatile, semi-volatile, pesticide and PCB constituents were not found in these monitoring wells. No wellhead protection areas (as designated by Section 1428 of the Safe Water Drinking Act) exist near the site.

A table presenting the number of persons utilizing the Village of Sandoval public water system in each distance category is presented below:

Distance (Miles)	Residents on Public Water
On-Site	18
0-1/4	445
1/4-1/2	630
1/2-1	414
1-2	348
2-3	1636
3-4	971



### Section 6.3 Surface Water Pathway

Surface water drainage from the site is in a radial pattern with two prominent paths being toward the east and west. Moisture on the site has also been found to either infiltrate into the cinder/slag fill or pool at various locations. Drainage from the site flows into two intermittent streams which border the site, one on the east and one on the west. Due to this situation there are two Probable Points of Entry (PPE) to the surface water from the site.

The PPE for the eastern drainage pathway is located at the northeast corner of the site. Surface water from the north side of the site enters into the designated wetlands. According to National Wetland Inventory Maps, Palustrine Emergent, seasonally flooded wetlands exist along both sides of the entire distance of the intermittent drainage way from the Sandoval Zinc Company site to Prairie Creek. This type of wetland and a palustrine scrub-shrub wetland then continues southwesterly along both banks of Prairie Creek for another 3700 feet.

The drainage pathway for the western portion of the site flows into an area of dense phragmites (common reed) and to the western drainage ditch. The initial perennial waterway for the western drainage way is located 3500 feet south-southwest of the site at the confluence of the drainage way and Prairie Creek. There are no known wetlands designated in the western drainage ditch leading to Prairie Creek.

The 15-mile target distance limit for the eastern drainage way extends from the PPE at the contiguous wetlands adjacent to Prairie Creek for approximately thirteen and one half miles southwest to Lost Creek, ending one and one half miles southwest of the confluence of Prairie Creek and Lost Creek.

The 15-mile target distance limit for the western drainage way extends from the PPE at Prairie Creek approximately twelve and one half miles southwest to Lost Creek, ending two and one half miles southwest of the confluence of Prairie and Lost Creek.

The closest permanent water body to the site is a small pond located on Sandoval Zinc property about fifty feet east of the eastern drainage way. This pond is an excavated palustrine unconsolidated bottom which is intermittently exposed wetland as indicated on the National Wetlands Inventory Map. Additional wetland type plants were noted, during the site reconnaissance and sampling event, in the drainage area north of the railroad tracks north of the Sandoval Zinc Company plant.

#### Section 6.4 Soil Exposure Pathway

The facility is no longer active and there is a partial fence surrounding the site. The perimeter fence was constructed a number of years ago, and it has repeatedly been vandalized and breached. There are numerous signs of recreational use on the property. With portions of the fencing down, tire tracks found onsite indicated that trespassers were riding dirt bikes, three and four wheeler vehicles and pickup trucks. There has also been evidence of fires on site.

The area immediately surrounding the Sandoval Zinc facility is considered to be a rural setting. There are no residents living on or within 200 feet of the site. Urban residential areas are located northwest, west and southwest of the former facility. Scattered rural residences are located throughout the four mile radius from the site. An estimated 1500 people live within one mile of the facility. The nearest resident is approximately 500 feet to the west of the facility. There are no schools or daycare facilities within 200 feet of documented soil contamination. The

area to the north of Sandoval Zinc is currently open field.

Due to Sandoval Zinc being in operation for many years, the potential exists that through the course of operations, contaminants such as lead and zinc may have been transported by various means throughout the Village of Sandoval. Because blood lead levels in children are a major concern, the Marion County Health Department was requested by the Illinois EPA to conduct a lead screening. On August 23, 1996, the Marion County Health Department conducted a special lead screening in Sandoval. Thirty-three children were tested, but none of the children tested exhibited a lead level of 10 ppb or above. The current standard for blood lead levels in young children and pregnant women is 10 micrograms per deciliter (g/dL) of whole blood (<http://www.cdc.gov/nceh/lead/publications/PrevLeadPoisoning.pdf>, 3/25/2010).

Soil samples were collected during the 2009 ESI from residential yards located within the municipal boundaries of the Village of Sandoval. Sixteen of the residences sampled revealed elevated levels of lead and zinc which can be attributed to the Sandoval Zinc operations. Five residential yards exhibited elevated levels of arsenic and four residential yards exhibited elevated levels of antimony, above the reference doses distinguished in the *Superfund Chemical Data Matrix*. These soil samples suggest that cinder/slag material from the site has been transported throughout the community for road and sidewalk base as well as residential yard fill material. Each of these residential yards is considered a source.

#### Section 6.5 Air Route

Past aerial photography of the site has shown smoke plumes being emitted from the stacks on the former retort furnaces and from the process building after use of the retorts were

discontinued. Assuming the plant was typical of secondary zinc smelters using the retort processing, metal rich air emissions potentially reached a range from 50 to 100 tons annually (Illinois EPA, 1991, Konzelmann). Prior to the installation of a stack scrubber on the smelter furnace, windblown ash, rich in zinc and other heavy metals, was deposited on the plant site, on the surrounding farm ground and in the Village of Sandoval. In addition to ash from the smelter furnaces, other windborne emissions may have been generated by plant waste handling procedures such as open storage of cinder/slag and ash as well as bulk storage of zinc oxide in open bins inside plant buildings. The potential for contaminated particulates to be carried off-site remains high as no mitigative measures have been implemented. Even though the facility has been inactive since 1985 with a fence constructed around the estimated extent of the cinder/slag fill, the property has been used by area residents as a venue for off road vehicle use. This is evidenced by their continued effort to tear down the fence and the numerous tire tracks throughout the site. Inhalation and ingestion are of concern due to these activities. An estimated 4,500 people live within a four-mile radius of the site. No schools or daycare facilities are located within 200 feet of observed soil contamination.

Population Table

Distance (in miles)	Population
0-0.25	18
0.25-0.50	445
0.50-0.75	630
0.75-1	414

1-2	348
2-3	1636
3-4	971

This data was accessed from the US Census data. Data from the US Census was used in an Arcview file and placed on a map. The Arcview program was then used to construct rings around the site. Population data points were then sorted out for each ring.

## **SECTION 7.0 SUMMARY**

The purpose of the Expanded Site Inspection was to determine if contamination still existed at the Sandoval Zinc facility and to determine if remediation objectives were being pursued. Upon completion of the ESI, it was determined that contamination still exists at the property and that the contamination is still impacting the wetlands and the creek to the east and south of the site. Remediation activities at the facility are not being completed nor are they currently being pursued.

In the past, Resource Conservation and Recovery Act (RCRA) personnel were conducting inspections of the site and attempting to regulate the activities at the facility. Due to bankruptcy proceedings, Sandoval Zinc is no longer being addressed through the RCRA program. Since the RCRA program is no longer applicable, Sandoval Zinc was unarchived from CERCLIS.

The Illinois EPA has discussed options on how to address the contamination of the site. Upon completion of these discussions it was suggested that the site continue in the CERCLA process.

Inorganic contaminants from past processes have been found in the surface water pathway. Contaminants have migrated from the site to the adjacent surface water body and

wetlands. Wetlands are located along the drainage pathway and Prairie Creek for approximately 1.1 miles (National Wetlands Inventory Map) from the probable point of entry. Inorganic levels exceed three times the background concentration for antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, selenium, silver, sodium and zinc (Table 4).

The groundwater pathway remains a concern. Drinking water for the City of Sandoval is supplied by the city of Centralia. Centralia obtains drinking water from surface water intakes located in Carlyle Lake and Raccoon Lake. Information collected by the Illinois EPA's Source Water Assessment Program (SWAP) ArcIMS Mapping Tool did not show any evidence of private drinking wells. Although there are no documented wells, there is a possibility of rural residents still utilizing private drinking water wells, which could be contaminated by past processes at the Sandoval Zinc Company site.

In the past, windborne contamination from the site may have been emitted from the smoke stacks associated with the operations at the Sandoval Zinc Company site. Contamination may have potentially been blown into the surrounding areas. Possible human exposure to airborne materials has not been documented.

Although the site is fenced, areas of the fence have been trampled or driven over, thus the fence is not a deterrent to trespassing. Evidence of trespassing has been documented with various pictures of vehicle tracks. Soil exposure to these individuals is a possibility. Also of a concern is the practice of all terrain vehicles stirring up the cinder/slag material and dust. This would enhance the possibility of individuals inhaling hazardous material.

Soil samples collected in residential yards within the Village of Sandoval revealed elevated levels of inorganics which can be attributed to the site. Discussions with local residents suggests that cinder/slag have been transported by individuals and utilized for road and sidewalk base as well as fill material for low areas throughout the community. Human exposure to these contaminants is possible in these areas around the City of Sandoval.

## **SECTION 8.0 REFERENCES**

- 1 Illinois Environmental Protection Agency,  
[http://163.191.83.31/dww/JSP/WaterSystemDetail.jsp?tinwsys\\_is\\_number=717390&tinwsys\\_st\\_code=IL&wsnumber=IL1214220](http://163.191.83.31/dww/JSP/WaterSystemDetail.jsp?tinwsys_is_number=717390&tinwsys_st_code=IL&wsnumber=IL1214220). 12/15/2009.
- 2 Illinois Environmental Protection Agency, Bureau of Land Files, Sandoval Zinc, LPC 1210500002.
- 3 Gibb, James P., and Keros Cartwright, Illinois Department of Natural Resources, Illinois State Geological Survey, Retention of Zinc, Cadmium, Copper and Lead by Geologic Materials, 1982. p.113.
- 4 United States Department of the Interior, National Wetlands Inventory Map of the Centralia East Quadrangle, 1987.
- 5 United States Department of the Interior Geological Survey, Topographical Map of the Centralia East Quadrangle, .
- 6 United States Department of Agriculture, Soil Survey of Marion County, Illinois. 1999.
- 7 Ebasco Environmental Inc., Sandoval Zinc Feasibility Study, April 7, 1993.
- 8 Illinois EPA. RCRA Inspection Report for Sandoval Zinc. December 5, 2005. 7 pages.
- 9 USEPA. Notification of Regulated Waste Activity for Sandoval Zinc Company. July 25, 1994. 2 pages.
- 10 Illinois EPA. Interviews with Ken Corkill from Sandoval Residents. Undated.

- 11 Illinois Department of Public Health. Public Health Assessment from Sandoval Zinc Company, Sandoval, Marion County, Illinois. 13 pages.  
<http://www.atsdr.cdc.gov/hac/pha/pha.asp?docid=602&pg=1>
- 12 <http://www.cdc.gov/nceh/lead/publications/PrevLeadPoisoning.pdf>, 3/25/2010.